REMARKS

In response to the Office Action, dated November 6, 2002, the applicants hereby make the following response. Originally claims 1-9 were filed in which claims 1, 3, 5 and 7 were independent. In response to a restriction requirement claims 7-9 were withdrawn. In a response, claims 1, 3 and 5 were amended and new claims 10-12 were added. In a further response, claims 1, 3 and 5 were amended, claim 4 was cancelled and new claims 13-17 were added. In this response, claims 1, 3 and 5 are being amended and claims 2, 6 and 13-17 are being cancelled. Applicants respectfully state that no new matter has been added.

Rejection Under 35 U.S.C. § 112, second paragraph

Claims 1 and 5 have been amended to overcome the rejection under 35 U.S.C. § 112, second paragraph, by amending "sealing ring" to "sealing resin".

Rejection Under 35 U.S.C. § 103(a)

Pending Claims 1-3, 5, 6 and 10-12 stand rejected under 35 U.S.C. § 103(a) as being purportedly unpatentable by *Ohsawa* (U.S. Patent No. 5,756,377) in view of *Yamasaki* (U.S. Patent 5,554,885). Pending Claims 13-17 stand rejected under 35 U.S.C. § 103(a) as being purportedly unpatentable by *Ohsawa* in view of *Yamasaki* in further view of Hassan (U.S. Patent No. 5,773,895). Claims 1, 3 and 5 have been amended and claims 2, 6 and 13-17 have been cancelled Applicants respectfully traverse the rejections and request withdrawal of same.

The present invention relates to a semiconductor device having the structure of an external ring which enhances the bonding strength of the sealing resin. The external ring surrounds the semiconductor chip and is formed with a plurality of through holes (See specification page 8, lines 13-15). The external ring may also include blind holes instead of the through holes.

Since the plurality of through holes are formed outside the perimeter edge of the semiconductor chip, the sealing resin is filled in the through holes to increase the contact area between the sealing resin and the external ring (See specification page 13 , lines 14-18). Accordingly, the bonding strength between the sealing resin and the external ring is improved which improves the mechanical strength of the semiconductor device (See specification page 8, lines 1-3 and page13 , lines 20-23).

The present invention also may include an expanded open portion positioned on the inner circumferential surface of the external ring (See specification page 19 , lines 13). The open expanded portion may be formed at an angle of 30° to 45° relative to the inner circumferential surface of the external ring (See specification page 19, lines 4-6). This open portion allows a larger area between the semiconductor chip and the external ring. Thus, the resin injection port for injecting the sealing resin is expanded by the corresponding amount. Accordingly, more sealing resin is injected between the semiconductor chip and external ring to increase the bonding strength while reducing the size of the external ring.

The *Ohsawa* reference teaches a manufacturing method of a lead frame to achieve a thinner semiconductor device. The *Ohsawa* reference teaches a semiconductor chip seated in a device hole formed in the protective insulation film (See Column 4, 31-38). A reinforcement plate is adhered to the rear surface of the insulation film for rigidity of the device (See Column 4, lines 55-58).

The applicants respectfully disagree with the Examiner that the *Ohsawa* reference teaches an external ring with a plurality of through or blind holes positioned on the perimeter edge of the semiconductor chip as shown in Figs. 4 and 5 of the present invention. The applicants respectfully submit that the Examiner has not shown the plurality of through holes positioned on the perimeter edge of the semiconductor chip in the *Ohsawa* reference.

Additionally, as the Examiner submits, the *Ohsawa* reference does not teach any sealing resin being filled in the through holes to increase the contact area between the sealing resin and the external ring to increase the bonding strength between the sealing resin and the external ring. Accordingly, the mechanical strength of the *Ohsawa* reference is not improved via the through holes. In the *Ohsawa* reference, a reinforcement plate is required to be adhered to the rear surface of the insulation film (See Column 3. Lines 1-5) to improve the device strength. Further, the *Ohsawa* reference does not teach an expanded open portion positioned on the inner circumference of the external ring (See specification page 19 , lines 13). Accordingly, the *Ohsawa* reference does not teach the angled open portion to allow a larger area between the semiconductor chip and the external ring.

The present invention further teaches an expanded open portion positioned on the inner circumferential surface of the external ring wherein the open expanded portion may be formed at an angle of 30° to 45° relative to the inner circumferential surface of the external ring. This open portion allows a larger area between the semiconductor chip and the external ring. The *Yamasaki* reference does not teach the expanded open portion of the present invention.

To establish a prima facie obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art See In re Royka, 490 F.2d 981, 180 U.S.P.Q. 580 (CCPA 1974). Further, not only must the Examiner find each element of the claimed invention in the prior art, the Examiner must show upon "rigorous application" the proper motivation or suggestion to combine wherein the showing "must be clear and particular" See In re Dembiczak, 175 F.3d 994, 999, 50 U.S.P.Q.2d 1614, 17 (Fed. Cir. 1999).

The Applicants respectfully submit that the Examiner's limitation analysis fails to demonstrate how the reference teaches or suggests the combination to yield the claimed invention wherein the claimed invention has among other elements sealing resin filled in the

through holes to increase the semiconductor device strength. In contrast, the references are never concerned with this issues since the primary reference is designed with a hole and reinforcement plate and accordingly while the secondary reference is designed for dispersing forces on the film tape. Thus, the references do not discuss or enable the same issues to be solved.

The problem solved by the invention is to provide a more rigid and stable semiconductor device via the use of the through holes. Thus, the invention addresses a different problem and proposes a much different solution from the problems and solutions in the art. See, In re Dembiczak, 175 F.3d 994, 999, 50 U.S.P.Q.2d 1614, 1617 (Fed. Cir. 1999)(Evidence of a suggestion, teaching or motivation to combine prior art references may flow, inter alia, from the references themselves, the knowledge of one of ordinary skill in the art, or from the nature of the problem to be solved)(Emphasis added).

In order to meet an obviousness requirement, the requirement has to meet some suggestion that the cited references have similar features or structures. To suggest otherwise pertains to hindsight reconstruction. The standard, rather, is whether the reference taken as a whole would have suggested the applicant's invention to one of ordinary skill in the plasma display arts at the time the invention was made.

Therefore, Applicants respectfully submit that since Claims 1, 3 and 5 are patentable, all dependent claims therefrom are also patentable.

CONCLUSION

In view of the foregoing, it is submitted that all of the pending claims are patentable. Further, the Examiner's rejections have been addressed herein. It is, therefore, submitted that the application is in condition for allowance. Notice to that effect is respectfully requested.

Respectfully submitted,

By its attorney,

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Date: 3/28, 2003

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Date

Doris M. Paino

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re U.S. Patent Application of: K. Ohsawa and H. Makino	)	
Serial No.: 09/009,248	)	Examiner: D. Graybill
Filed: January 20, 1998	)	Group Art Unit: 2814
For: LEAD FRAME AND SEMICONDUCTOR DEVICE HAVING THE SAME	)	

VERSION WITH MARKINGS TO SHOW CHANGES MADE

In The Claims

1. (Third Amendment) A semiconductor device, comprising:

a semiconductor chip having a plurality of electrode pads formed at a periphery of a front surface thereof;

a wiring film formed on the front surface side of said semiconductor chip by laminating an insulation film on a lead pattern;

an outer connection terminal formed so as to protrude above said wiring film;

a plurality of leads extending from said wiring film and connected to the electrode pads on said semiconductor chip at extended tips end thereof;

an external ring provided so as to surround said semiconductor chip and formed with a plurality of through holes positioned entirely outside of a perimeter edge of the semiconductor chip, the external ring comprising an outwardly expanded portion formed on an inner circumferential surface of the external ring and positioned on a rear surface of the semiconductor chip; and

a sealing resin filled between said semiconductor chip and said external ring, the sealing resin further being filled in the through holes to increase the contact area between the sealing resin and the external ring which strengthens the bond between the sealing [ring] resin and the external ring.

3. (Third Amendment) A lead frame, comprising:

a wiring film formed by laminating an insulation film on a lead pattern;

an external connection terminal formed so as to protrude above said wiring film;

a plurality of leads extending from said wiring film and forming connecting portions to electrode pads on a semiconductor chip at extended tip ends thereof;

an external ring provided outside said wiring film, having an opening portion capable of housing said semiconductor chip and formed with a plurality of through holes positioned entirely outside of a perimeter edge of the semiconductor chip when the opening portion houses the semiconductor chip wherein an outwardly [extended] expanded open portion is formed on [the opening portion] an inner circumferential surface of the external ring and positioned on a rear surface side of the semiconductor chip such that the expanded open portion is formed at an angle of 30° to 45° relative to the inner circumferential surface of the external ring.

5. (Third Amendment) An electronic apparatus including a printed wiring board loaded with a semiconductor chip, said semiconductor device, comprising:

a semiconductor chip having a plurality of electrode pads formed at a periphery of a front surface thereof;

a wiring film formed on a front surface side of said semiconductor chip by laminating an insulation film on lead patterns;

an outer connection terminal formed so as to protrude above said wiring film;

a plurality of leads extending from said wiring film and connected to the electrode pads on said semiconductor chip at extended tip ends thereof;

an external ring provided so as to surround said semiconductor chip and, formed with a plurality of through holes positioned entirely outside of a perimeter edge of the semiconductor chip, the external ring comprising an outwardly expanded portion formed on an inner circumferential surface of the external ring and positioned on a rear surface of the semiconductor chip; and

a sealing resin filled between said semiconductor chip and said external ring, the sealing resin further being filled in the through holes to increase the contact area between the sealing resin and the external ring which strengthens the bond between the sealing [ring] resin and the external ring, wherein said external connection terminal and an electrode on said printed wiring board are connected.

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